Lat 40.61157 - Lon -121.51508

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Reply to: 3420

Date: January 30, 1998

Subject: Jeffrey pine beetle-related mortality in the Highway 44 Fuel break and surrounding area (Report NE98-3)

To: District Ranger, Hat Creek Ranger District, Lassen National Forest

At the request of John Robbins, Sale Administrator, I conducted a field evaluation of the Highway 44 fuel break on January 27, 1998. The objective of the field visit was to determine what bark beetles were involved with the conifer mortality and to discuss which trees should be included in the current, ongoing thinning project. The area examined included Unit 13 and the surrounding stand to the north (T 32N, R 4E, Sec. 21,22). The area is along the North side of Highway 44 and is currently being thinned to create a fuel break. This stand has high visibility and warrants immediate concern regarding the current bark beetle outbreak and potential for a continual increase in dead and dying trees within the fuel break and surrounding stands.

Existing Condition

The stand in Unit 13 is almost pure Jeffrey pine. There are a few lodegpole pine trees scattered throughout. The stand was initiated following the last eruption of Mount Lassen in 1917. The area we examined was encompassed in the mud flow during the eruption. There were a few large diameter trees that survived the eruption that have been removed over the years. The oldest trees in the current stand are about 70-80 years old. The basal area prior to the fuel break thinning was 260-280 sq. ft./acre. Logging equipment was operating in the area at the time of the field evaluation.

Older and current (infested in 1997) Jeffrey pine mortality in size classes greater that 6-8 inches DBH is occurring in Unit 13 and in the stand directly to the north, outside of the fuel break boundary. The mortality has been occurring for several years as evidenced by the condition of the dead trees. The mortality is due primarily to overstocking and successful attacks by Jeffrey pine beetles, Dendroctonus jeffreyi (detailed information attached). Red turpentine beetles, Dendroctonus valens, are also very active in the stand. Most of the dead trees were infested with both species of bark beetles.

Jeffrey pine ranging from about 6" to 20" DBH are affected. Based on tree condition, the Jeffrey pine beetle infestation appears to have started about three years ago. The number of trees attacked in subsequent years has increased annually. In the immediate vicinity of last years group kills there are several pockets (15-20 trees/pocket) of trees that were attacked during the flight season in 1997. These trees are considered to be "green infested", which implies that they have been successfully attacked by Jeffrey pine beetle, but have not experienced crown fade. The combination of gallery construction, larval feeding and the inoculation of the tree with blue stain fungi will cause

tree death. Some crowns are beginning to fade; however, complete fading may not become apparent until this coming spring. Jeffrey pine beetles do not tend to fly far after emerging, so group kills tend to increase in size over several years if the beetle populations remain high and the trees remain susceptible to successful attack.

In general, Jeffrey pine beetle-related mortality on the east side has declined somewhat, but not as much as anticipated following the past two normal or above normal precipitation years. Based on the number of Jeffrey pine trees attacked this year (in the vicinity of last years group kills) the level of mortality is remaining about the same as in the previous 2-3 years. Subsequent surveys will be conducted in the spring to better assess the infestation and determine how many trees were successfully attacked by Jeffrey pine beetles last year. There are three additional areas where FPM is monitoring ongoing infestations: Manzanita Lake Campground and Lost Spring crossing of Hwy 89, both in Lassen Volcanic National Park, and the Pole Springs area on the Eagle Lake RD, Lassen National Forest. These infestations have been ongoing for 3-4 years.

The red turpentine beetle is also very active in this stand. Most of the trees infested with Jeffrey pine beetles are also infested with red turpentine beetles; however, there are a number of trees that are infested with red turpentine beetles only. Characteristic of red turpentine beetle, most attacks were within the first few feet around the base of the tree. Observations made in the Potato thinning units in 1996 (See FPM Evaluation Number NE96-7) indicated that the red turpentine beetles were attracted to the cut stumps associated with the thinning operation. In this case the red turpentine beetle attacks occurred prior to the current thinning operation so it is likely the beetles were keying in on the Jeffrey pine beetle infestation and the overstocked condition of the stand.

DISCUSSION

The priority issue identified was the ability to distinguish the "green infested" trees so they can be identified and removed during the ongoing thinning operation. It is recommended that **ALL** green trees currently infested with Jeffrey pine beetles be removed. As noted earlier, these beetles do not tend to fly very far after emergence, so the best management strategy to reduce the number of trees attacked this year, is to remove **ALL** green infested trees prior to beetle emergence (May 31). Circumstantially successful Jeffrey pine beetle suppression projects are ongoing in the Lake Tahoe Basin Management Unit and in Lassen Volcanic National Park. The objective of these projects is to identify and remove all green infested trees prior to beetle flight on an annual basis until an acceptable level of mortality is obtained and maintained. Projects have been highly successful at reducing the number of infested trees in the year following the suppression project.

For a suppression project to be efficacious, in terms of reducing mortality, the infested trees need to be removed prior to beetle emergence in June of 1998. Based on the observations in the fuel break, newly infested trees are in the immediate vicinity of trees that faded last year, indicating that suppression efforts would be a viable option to consider in an attempt to reduce further mortality associated with the group kills. These activities combined with the ongoing thinning efforts will reduce the level of mortality in subsequent years enabling managers to meet their management goals and

objectives and improve forest health conditions such that the vegetation is more resilient to the frequent protracted drought periods experienced in California.

A complete survey of all Jeffrey pine trees with live crowns is necessary to determine which trees have been successfully attacked (green infested) by Jeffrey pine beetle. The survey should encompass the entire fuel break and the adjoining stand to the north. Green infested trees would need to be removed from the site, by June 1, 1998, prior to beetle emergence. Yearly treatment and surveillance would be required dependent upon beetle activity. Direct control, coupled with the thinning project will lower the residual trees susceptibility to bark beetles in the future. Based on information from other areas where this alternative has been implemented for these beetles, the number of infested trees in the immediate vicinity will be greatly reduced next year. The current number of dead trees from which the beetles have already emerged should provide an adequate number of snags. Reducing the level of mortality will provide more options for management in the future. Planned management activities, contrasted with no management, will result in stands meeting goals and objectives in terms of species composition, tree spacing and stocking levels, crown closure, fuel loading, snag recruitment and other desired components.

The red turpentine beetle normally attacks injured, weakened or dying trees and freshly cut stumps. The adults are attracted by fresh pine resin. A beetle-produced aggregation pheromone is also important in attracting additional beetles into suitable hosts. Attacks usually occur at the soil line or root crown and are characterized by a large reddish pitch tube at the point of entry. If an attack is successful, the adults excavate an irregular gallery in the cambium and the female lays eggs along the sides. Attacks usually do not kill trees but may predispose them to attack by other bark beetles. Repeated or extensive attacks by the red turpentine beetle can kill pines. It is possible that the cut stumps in the fuel break will attract emerging beetles this spring. Possible spill over into residual trees should be expected and monitored.

Little can be done to control red turpentine beetles once they are beneath the bark. Good health and vigor in a tree are the best protection against infestation. The feeding activity of the adult beetles and their larval offspring kills a limited amount of living tissue. If enough beetles attack a tree so that feeding areas overlap the tree will die as a consequence of the girdling. The amount of beetle-related damage depends on the health of the tree; therefore, the exact number of attacks required to cause tree mortality cannot be predicted.

Marking guidelines

All trees with successful Jeffrey pine beetle attacks should be removed. Successful attacks can be distinguished most readily by pitch tube color. Pitch tubes that are white or creamy in color are not successful. Trees with only these types of pitch tubes do not need to be removed. Trees with pink to reddish colored pitch tubes containing frass and boring dust have been successfully attacked and should be removed. Trees that have a combination of successful and unsuccessful attacks should be removed.

Trees that only have red turpentine beetle attacks are not likely to die at this time. Red turpentine beetles generally attack below DBH as opposed to Jeffrey pine beetles which tend to attack mid bole and then fill in above and below. The pitch tubes created by red turpentine beetles are large, reddish to pink in color, and very pitchy (dripping). Trees that have a combination of red turpentine beetle attacks and successful Jeffrey pine beetle attacks should be removed. The attached figures illustrate the differences in pitch tubes and gallery patterns between red turpentine beetles and Jeffrey pine beetles.

Conclusions

To reduce/limit unacceptable levels of bark beetle-related mortality in the fuel break and adjoining stand consideration should be given to removing "green infested" trees at this time, thinning, and salvage would likely enable the District to meet its management objectives for the fuel break. Forest Pest Management can assist with implementing the marking guidelines suggested above if needed. In addition, Forest Pest Management suppression funds can be used for these types of treatments.

Please contact me at 530-252-6667 if you have questions regarding this evaluation or need further assistance.

Sheri Lee Smith
Entomologist
NE CA Shared Service Area

Jeffrey Pine Beetle, Dendroctonus jeffreyi

The Jeffrey pine beetle is the principle bark beetle found attacking Jeffrey pine, which is its only host. It is a native insect occurring from southwestern Oregon southward through California and western Nevada to northern Mexico. The beetle normally breeds in slow-growing, stressed trees. The beetles prefer trees which are large, mature, and occur singly rather than in groups. When an epidemic occurs, the beetle may attack and kill trees greater than 8 inches in diameter, regardless of age or vigor. Often the beetle infests lightning-struck or wind-thrown trees, but does not breed in slash.

Evidence of Attack

Presence of the beetle is usually detected when the foliage changes color. The color change of the foliage is related to the destruction of the cambium layer by the beetle. Generally, the top of the crown begins to fade in a slow sequence, with the needles turning from greenish yellow, to sorrel, and finally to reddish brown. By the time the tree is reddish brown, the beetles have usually abandoned the tree. Another sign of beetle attack are pink to reddish pitch tubes projecting from the bark of the infested tree. If examined carefully, pitch tubes can be detected on infested green trees prior to crown fade. Jeffrey pine beetles have a distinctive "J" shape egg gallery pattern on the inner bark. Larval mines extend across the grain and end in open, oval-shaped pupal cells.

Life Stages and Development

The Jeffrey pine beetle is one of the larger pine bark beetles in California. The beetle has four life stages, egg, larva, pupa, and adult. The adults are stout, cylindrical, black, and approximately five-sixteenths of an inch long when mature. The egg is oval and pearly-white. The larva is white, legless, and has a yellow head. The pupa is also white but is slightly smaller than the mature larva. The life cycle is normally completed in one year in the northern part of the range, but in the southern part, two generations per year may occur. The principle period of attack is in June and July, but attacks also are frequent in late September and early October. Similar to other Dendroctonus species, Jeffrey pine beetles use pheromones that attract other beetles to a tree, causing a mass attack that tends to overcome the tree's natural resistance. Blue stain fungi are associated with Jeffrey pine beetle attacks and aid in overcoming the tree.

Conditions Affecting Outbreaks

Normally the Jeffrey pine beetle is kept in check by its natural enemies, climatic factors, and the resistance of its host. Similar to other Dendroctonus species, the availability of suitable host material is a key factor influencing outbreaks. Healthy trees ordinarily produce abundant amounts of resin, which pitches out attacking beetles. When deprived of moisture, trees cannot produce sufficient resin flow and they become susceptible to successful beetle attacks.

Red Turpentine Beetle, Dendroctonus valens

The red turpentine beetle, Dendroctonus valens, occurs throughout California and can breed in all species of pines. It normally attacks injured, weakened or dying trees and freshly cut stumps. The adults are attracted by fresh pine resin. They often attack wounded trees in campgrounds or following logging, trees scorched by wildfire or prescribed burns, lightning-struck trees and root-diseased trees exhibiting resinosis.

Attacks usually occur at the soil line or root crown and are characterized by a large reddish pitch tube at the point of entry. On severely stressed trees or during periods of drought, attacks may occur underground on the main roots up to 15 feet from the bole and also on the bole to a height of 10 feet. If an attack is successful, the adults excavate an irregular gallery in the cambium and the female lays eggs along the sides. The larvae feed in a mass and destroy an area of cambium ranging from 0.1 to 1.0 square feet. Attacks do not always kill trees but may predispose them to attack by other bark beetles. Repeated or extensive attacks by the red turpentine beetle can kill pines.

Attacks occur throughout warm weather and peak at mid-summer. The number of generations varies from two years for a single generation at the coldest portions of its range to two or three per year in the warmest. Attacks can be minimized or prevented by avoiding soil compaction and injury to standing trees during logging or construction and also by insecticide application to high value trees.

Hwy 44 Mud Creek
HCRD.

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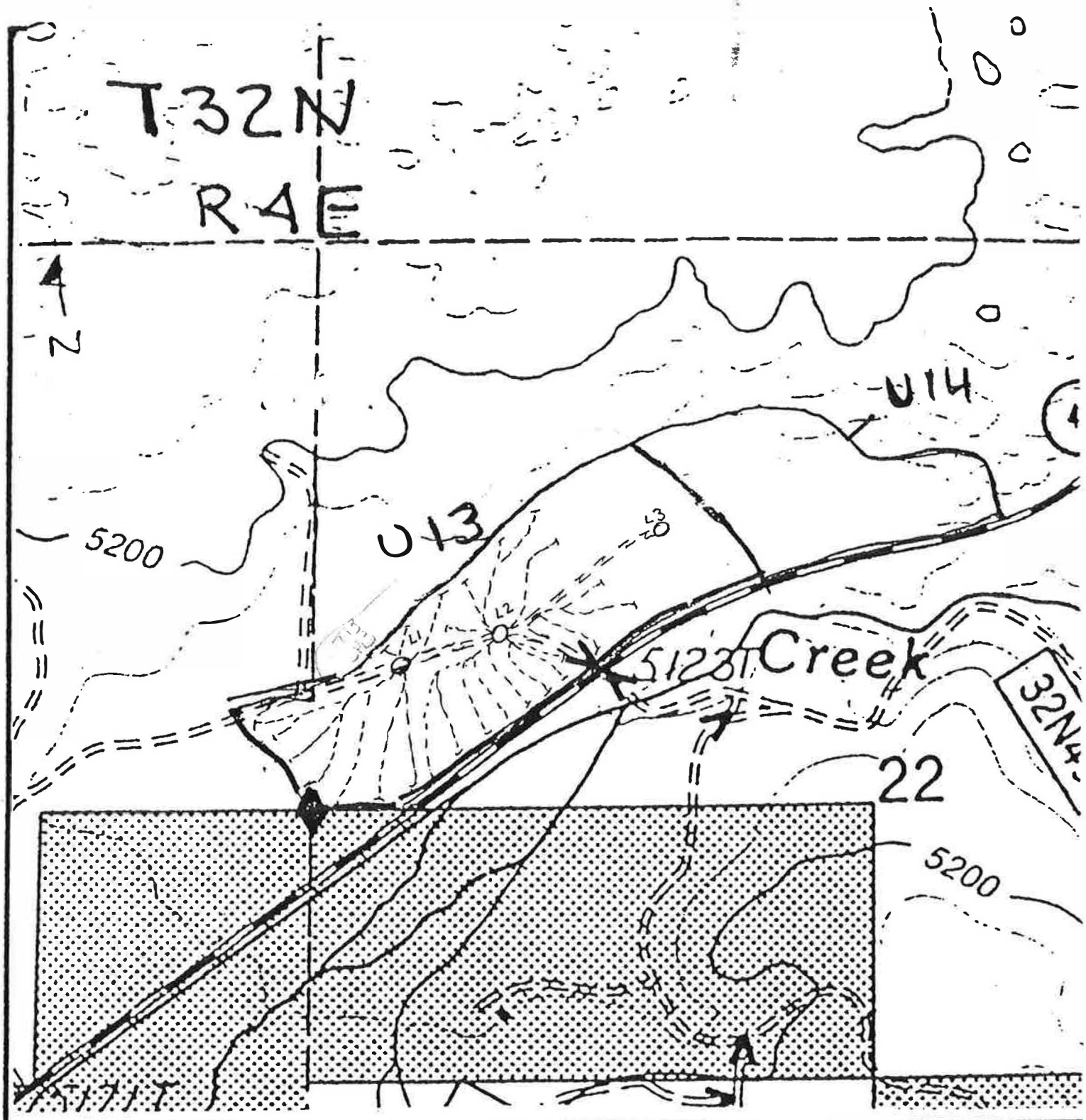

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